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Montgomery County Board of Education
Montgomery County Schools
Carver Educational Services Center
850 Hungerford Drive
Rockville, MD 20850

January 20, 2016

Dear Montgomery County Board of Education,

It has come to my attention that your school district is addressing the health risks of wireless radiofrequency radiation exposure in the classroom. I am writing to provide accurate scientific information on this matter.

I was Founding Director of the Board on Environmental Studies and Toxicology of the U.S. National Research Council, and Founding Director of the Center for Environmental Oncology at the University of Pittsburgh Cancer Institute. President Clinton appointed me to the Chemical Safety and Hazard Investigation Board, and I am former Senior Advisor to the Assistant Secretary for Health in the Department of Health and Human Services. I founded the non-profit Environmental Health Trust in 2007 to provide basic research and education about environmental health hazards. Our scientific team is currently focusing on the health risks of radiofrequency radiation as an important public health issue.

Many people are unaware that cell phones and wireless laptops and tablets function as two-way microwave radios. A typical classroom might have the following scenario: every student has a laptop, a cell phone in their pocket, a network transmitter on the ceiling and maybe a cell tower right outside the window next to the sports field. All of these devices emit microwave radiation which can be readily absorbed into children's bodies and brains in the classroom. Manufacturers specifically recommend that cell phones be used “as tested”—at a minimum distance from the body—and as a result, *Consumer Reports* in November advised that people should not keep phones in the pocket—advice that few children or adults appreciate. *These devices have never been tested for safety with children.* Accumulating research indicates that long-term exposure to low levels over long lifetimes could pose a serious risk to our health.

As one of the leaders in educational policy of this nation, your school district has an opportunity to set an example for school districts nationwide by taking prudent action, installing safer technology in classrooms and educating students, teachers and staff about how to reduce their radiation emissions and exposures. A number of schools have already implemented such policies appreciating that *the absence of*

definitive proof of harm is not proof of safety. Just as we provide children with seat belts and bike helmets, we need to provide children with safer technology aimed at reducing exposures and preventing harm. A precautionary approach to wireless is recommended by many scientists and governments worldwide.

THE FINE PRINT SAFETY INSTRUCTIONS

Most children and their parents are unaware that wireless devices have safety instructions buried deep in the manufacturer's' user safety manuals. These fine print warnings instruct about distances that people should hold devices away from their bodies *in order to ensure they do not get exposed to high levels of radiofrequency radiation that exceed our government regulations.*

For example, the Federal Communications Commission (FCC) states of laptops and computers that "mobile devices are transmitters designed to be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons."

The Chromebook manual states:

"United States of America USA and Canada Safety Requirements and Notices

- Do not touch or move antenna while the unit is transmitting or receiving.
- Do not hold any component containing the radio such that the antenna is very close or touching any exposed parts of the body, especially the face or eyes, while transmitting.
- Regardless of the power levels, care should be taken to minimize human contact during normal operation.
- This device should be used more than 20 cm (8 inches) from the body when wireless devices are on and transmitting.
- FCC Statement for Wireless LAN use: *"While installing and operating this transmitter and antenna combination the radio frequency exposure limit of 1mW/cm2 may be exceeded at distances close to the antenna installed. Therefore, the user must maintain a minimum distance of 20cm from the antenna at all times."*

Please note that 20 cm is just less than 8 inches. View the full Chromebook manual here http://www.manualshelf.com/compare/samsung/chromebook-xe303c12-notebook-xe303c12a01us/samsung/np-rc418-s02ph

I understand that the County is bringing in Chromebooks and allowing cell phones into classrooms as educational tools for the curriculum. Cell phones *also* have fine print instructions and, like laptops, phones should not be held directly to the body and in fact maintained a specified distance away from the body- according to the manual. If cell phones are used in classroom *and students are unaware of this,* students may be handling these devices in an unsafe manner. Read cell phone instructions for various models at http://showthefineprint.org. I invite you to look at our newly posted Ebook that details fine print safety instructions in wireless device user manuals.

LACK OF ADHERENCE TO THESE SAFETY INSTRUCTIONS CAN EXPOSE CHILDREN TO A KNOWN HEALTH HAZARD

When children violate these safety instructions, they are exposing themselves to radiofrequency (RF) radiation levels which can exceed our government FCC RF radiation exposure limits. The FCC RF exposure limit was designed to protect the public from the thermal (heating) effects of acute exposure to RF energy. The FCC states, "Tissue damage in humans could occur during exposure to high RF levels because of the body's inability to cope with or dissipate the excessive heat that could be generated. Two areas of the body, the eyes and the testes, are particularly vulnerable to RF heating because of the relative lack of available blood flow to dissipate the excess heat load."

This safety information specifying that Chromebooks should be held at least 20 cm (about 8 inches) means that laptops *should not* be placed on children's laps, despite the name "*Laptop."* Even if the laptop is on the table, children with shorter arms often *bend into their screens*, exposing their heads and eyes to higher amounts of this radiation. Cell phones should not be placed in pockets and bras.

It is very important that students and staff are informed about these health and safety instructions. Otherwise they could be unknowingly exposing themselves to unsafe radiofrequency radiation levels—according to the U.S. government.

CHILDREN ABSORB MORE RADIATION THAN ADULTS

There is clear and compelling scientific evidence that children absorb more radiation than adults and their brains are especially vulnerable. FCC regulations employ a large adult male model for the certification of wireless devices. Children have smaller heads, thinner skulls and different dielectric properties, so this radiation penetrates their tissue more deeply.

I would like to draw your attention to our recently published research in the IEEE *Spectrum* where researchers at the Federal Universities of Brazil share new state-of-the-art radiation exposure brain modeling which confirms that substantially higher radiation doses occur in younger children as compared to adults. The online link is http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=7335557

Thus, this research indicates that compliance with these FCC fine print safety warnings is inadequate to protect children.

FCC REGULATIONS ARE OUTDATED

FCC exposure limits are outdated as they were last reviewed 18 years ago and were based on decades-old research. The Government Accountability Office published a 2012 Report that calls on the FCC to formally reassess their current RF energy (microwave) exposure limits, stating that the "FCC RF energy exposure limit *may not* reflect the latest research." I encourage you to read scientific submissions to FCC Proceeding Number 13-84 at http://bit.ly/1aGxQiq. It is unknown when the FCC will make a ruling, however, *until that time* the current outdated FCC limits are *not reflective* of the current state of science.

FCC REGULATIONS DO NOT PROTECT THE PUBLIC FROM BIOLOGICAL EFFECTS

Even if you follow these fine print instructions, *you may be at serious risk of harming your health*. FCC regulations did not consider effects from long-term exposures to low levels. As the California Medical Association states in their 2014 Resolution calling for updated FCC Regulations, "peer reviewed research has demonstrated adverse biological effects of wireless EMF [electromagnetic fields] including single and double stranded DNA breaks, creation of reactive oxygen species, immune dysfunction, cognitive processing effects, stress protein synthesis in the brain, altered brain development, sleep and memory disturbances, ADHD, abnormal behavior, sperm dysfunction, and brain tumors."

In May 2015, over 200 scientists who have authored more than 2,000 articles on this topic appealed to the United Nations to address "the emerging public health crisis" related to cellphones and other wireless devices, urging that the United Nations Environmental Programme (UNEP) initiate an assessment of alternatives to current exposure standards and practices that could substantially lower human exposures to non-ionizing radiation. These scientists state that "the ICNIRP guidelines do not cover long-term exposure and low-intensity effects, " and are " insufficient to protect public health." They also state that "the various agencies setting safety standards have failed to impose sufficient guidelines to protect the general public, particularly children who are more vulnerable to the effects of EMF." Please see their website at https://emfscientist.org.

FCC regulations are based on protecting people from *heating effects* only, and they do not consider *non-heating* biological effects. In other words, even if a student is following the safety instructions, such as keeping 8 inches from the Chromebook, they will *not* be protected from injury.

INCREASED CANCER RISK

Wireless radiofrequency radiation was classified as a Class 2B "Possible Human Carcinogen" by the World Health Organization's International Agency for Research on Cancer in 2011. According to many scientists, evidence *has increased* since 2011, indicating that cell phone and wireless radiation should be classified as a "probable carcinogen." Those exposed at younger ages show four to eight times increased cancer risk. In addition, replicated research recently published in Biochemical and Biophysical Research Communications has shown that radiofrequency can act as a *tumor promoter* at low to moderate exposure levels.

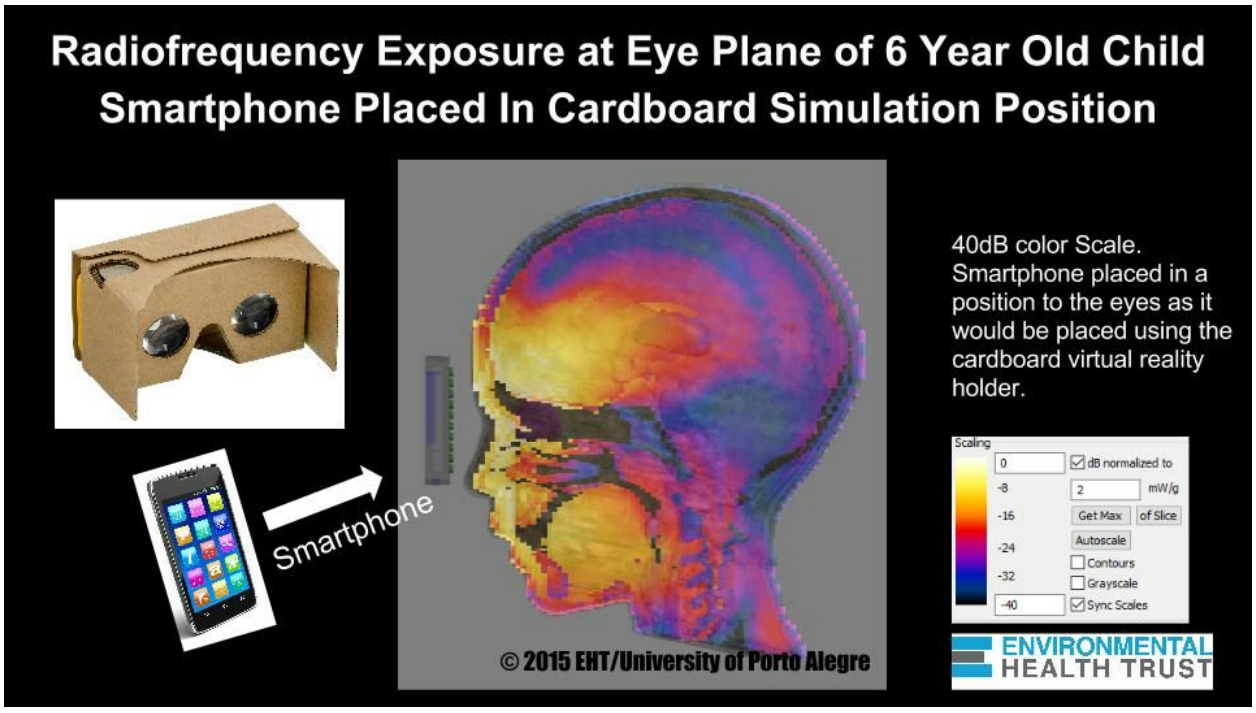
CONCERN FOR PREGNANT STUDENTS AND STAFF

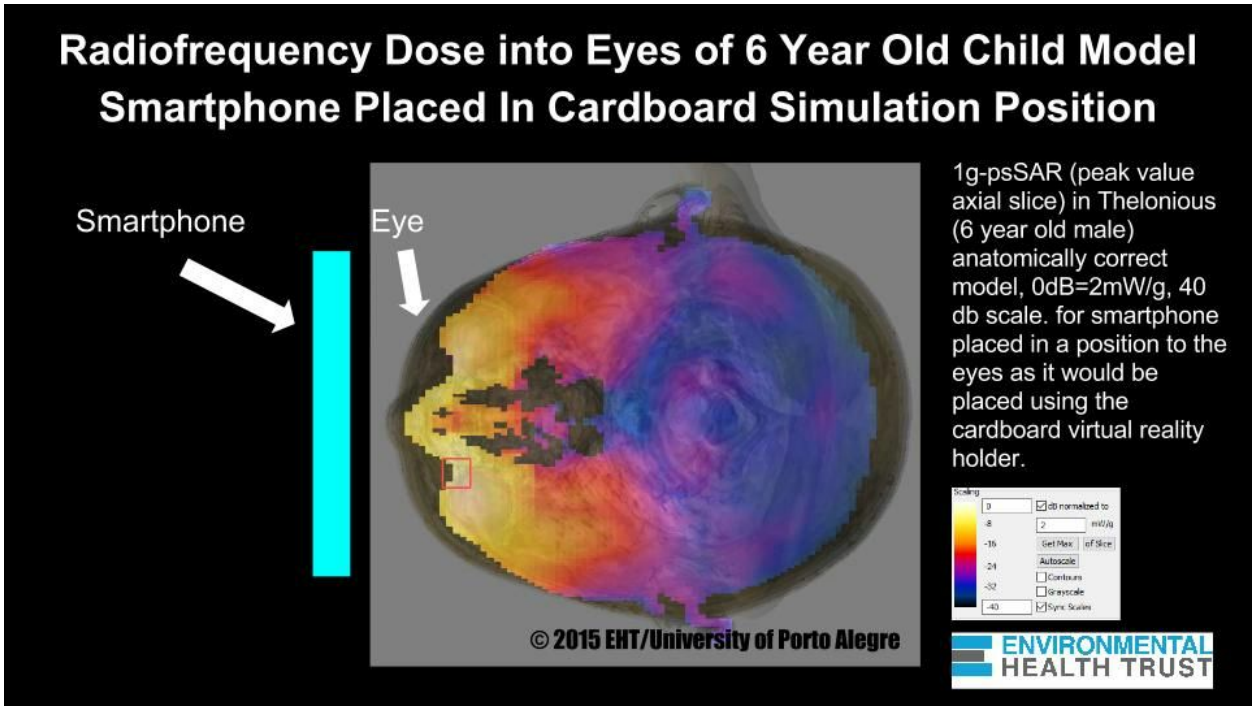
Pregnant students and staff are especially at risk from wireless because the fetus is the most vulnerable to toxic exposures. Several experimental studies are showing irreversible changes after prenatal exposure to cell phone and wireless radiation such as altered brain functioning, decreased brain cells and altered reproductive organ development. More than 100 physicians, scientists and public health professionals joined together to express their concern about the risk that wireless radiation poses to pregnancy and now urge pregnant women to limit their exposures. Please read these scientists BabySafe Joint Statement and their recommendations to reduce wireless exposures at http://www.babysafeproject.org.

VIRTUAL TECHNOLOGY RESULTS IN HIGHER EXPOSURES TO THE EYE AND BRAIN

Most recently, I was contacted by a parent in your district about the virtual reality devices now used in MCPS classrooms to go on a virtual "field trip." As I understand it, this experience involves smartphones placed directly in front of the child's eyes so that they can watch a fascinating video of faraway lands. The smartphone is streaming radiation throughout the classroom from the teacher's iPad for the entire "field trip."

I urge you to forgo the use of such devices as there is no research that has considered their impact on children's eyes. Upon hearing about this issue, I contacted scientists who do state-of-the-art computer modeling in order to understand how children's brains might absorb cell phone radiation from this virtual reality system. I asked them to position the phone in front of the child's face and assess the radiation exposures into the child's brain and eyes. Please see the preliminary images these scientists sent that show the radiation absorption into a child's eyes and brain when a smartphone is placed in a position about as close as it would be with the cardboard apparatus.





This research utilizes a sophisticated computer system that the U.S. Food and Drug Administration (FDA) currently applies to evaluate medical devices. It simulates the radiation absorption into *anatomically correct models.* Unfortunately, the current way that cell phones are certified in this country does not utilize such advanced technology. Instead, a 220-pound artificial head filled with a homogenous liquid is used in cell phone certification testing, as mandated by outdated FCC regulations. This system does not adequately replicate the way radiation is absorbed into a living brain, nor into a child's smaller skull and brain. Imaging that uses anatomically correct models renders a more accurate understanding of how children's brain tissue absorbs radio frequency radiation.

Several scientific investigations have shown that cataracts among humans and laboratory animals occur as a result of eye exposure to microwave/radiofrequency radiation. The eyes are highly vulnerable to radiation damage because they contain few blood vessels. In a study from Memorial Sloan-Kettering Cancer Center, radiation physicist David Gultekin, working with Bell Labs electrical engineer Lothar Moeller, reported that normal working cell phones can create tiny hotspots within brain tissue. Unlike other organs, eyes do not have circulation to effectively carry away heat.

In addition to the impact from the microwave radiation, there could also be impacts to a child's retina from the blue light emitted by the screen. Youths under the age of 20, and especially very young children, have little or no yellowing of the lens (which helps protect the adult eye). Therefore, blue light (or UV) which enters the eye is unfiltered in children and strikes the retina at full-strength exposing not only the retina, but the lens to possible damage. Such injury may not be evident until later in time. This is an area of active research.

In 2010, Andreas Christ and team reported children's hippocampus and hypothalamus absorbs 1.6–3.1 times higher and the cerebellum absorbs 2.5 times higher microwave radiation compared to adults';

children's bone marrow absorbs 10 times higher microwave radiation than in adults, *and children's eyes absorb higher microwave radiation than adults.*

Very importantly, FCC regulations set decades ago did not utilize science that looks at the effects from cell phones on different body tissues such as the eyes.

SIMPLE STEPS WILL PROTECT CHILDREN

Compelling research raises the possibility of very serious harm to children from radiofrequency radiation exposures well below "FCC compliant" levels. Legal does not mean safe. Therefore the smart choice for school decision makers is to act now and reduce radiofrequency wireless exposures. In fact, many countries (over 20) and health authorities worldwide are recommending reducing radiofrequency radiation to children. More recently, the Cyprus Government's National Committee on Environment and Children's Health released a video about reducing wireless and I invite you to watch this excellent example of responsible action at this link https://www.youtube.com/watch?v=H43IKNjTvRM .

I understand that your county has a Bring Your Own Device policy whereby cell phones are not only allowed *in* the classroom but are actively used in the curriculum. As I have been told, students in film class might use their cell phones to take footage to create a movie, and in some math classes they use their cell phones as a calculator. Advice should be routinely provided to any student using a wireless device at school about *how to reduce exposures*. For example, if phones are used on airplane mode, and wireless is turned off of computers then these devices will neither send nor receive microwave radiation, resulting in zero microwave exposure from the device.

When powered on, phones undergo short bursts of microwave radiation 900 times per minute, *whether or not the phone is being used for talking.* Once teachers and students are educated on how they can simply turn their phone onto airplane mode, then they can use the phone in the classroom *without* being exposed to unnecessary radiofrequency radiation.

Likewise, laptops such as Chromebooks are also emitting constant radiation and at much higher levels when a student is streaming video or using cloud based applications. Laptops can easily be hardwired to ethernet so that students can safely use the internet without radiation emissions. Please review the Best Practices for Low EMF in Schools developed by the Northeast Collaborative For High Performing Schools which details exactly how schools can reduce exposure to radiofrequency fields and still have full internet connectivity.

The children in your schools will have a lifetime of exposure. It is my recommendation, along with the recommendation of over 200 scientists (see https://emfscientist.org) and health authorities worldwide, that the best course of action is to take simple precautions—as many nations already currently advise. *Children's exposures to wireless radiation should be reduced as much as possible.* We have a responsibility to act now to reduce children's exposure to radiofrequency radiation. Children's nervous, immune and reproductive systems are rapidly developing and, along with pregnant women, children deserve an abundance of caution.

As several colleagues and I wrote in a letter to the U.S. Secretary of Education just a few months ago, we recommend your school district do the following:

1. **Raise school community awareness through new educational curriculum:** Students, teachers and their families should be given information on wireless health risks and simple precautionary steps they can take to protect their health. It is important to teach children how to use technology both safely and more responsibly in order to protect their health and wellbeing.

2. **Install a safe communication and information technology infrastructure in schools to meet educational needs:** Solutions exist to reduce exposures to wireless emissions and mitigate the health risk. Low-EMF Best Practices have been developed, allowing educational needs to be met with safer, hard-wired Internet connections, which are also faster and more secure.

Low-EMF Best Practices are the solution that allows for full communication, information access and learning tools use in the classroom while minimizing unnecessary health risks. Your district can thoughtfully integrate safe technology into every classroom while responsibly safeguarding the health of every generation.

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